Morbidity after neck dissection in head and neck cancer patients
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SHOULDER PAIN AND DISABILITY IN DAILY LIFE,
FOLLOWING SUPRAOMOHYOID NECK DISSECTION:
A PILOT STUDY.

C. Paul van Wilgen, 1,2, Pieter U. Dijkstra, 1,2, Jan M. Nauta, 2
Albert Vermey, 3 Jan L.N. Roodenburg, 2


shoulder pain and disability following modified radical neck dissection were still high, varying between 36 % and 77 % (Leipzig et al., 1983, Schuller et al., 1983, Pinsolle et al., 1997).

Increased insight in the biological behaviour of head and neck squamous cell carcinoma, and improved staging, led to the development of four types of selective neck dissection (Figure 1): supraomohyoid neck dissection (levels I, II, and III), lateral neck dissection (levels II, III, and IV) posterolateral neck dissection (levels II, III, IV, and V), and anterior neck dissection (level VI) (Robbins et al., 1991). With these selective neck dissections all non-lymphatic structures mentioned are spared.

Supraomohyoid neck dissection is often performed for oral or oropharyngeal squamous cell carcinoma, in patients with N0 tumours and is possibly sufficient in the treatment of a selected group of patients with positive nodes at level I (Medina and Byers, 1989, Kowalski et al., 1993, Kligerman et al., 1994, Spiro et al., 1996). Although supraomohyoid neck dissections are frequently performed little is published about shoulder morbidity, and the consequences for daily activities. Pinsolle et al. (1997) described 41 patients following supraomohyoid neck dissection, with 32% having minor, 5% moderate, and 2.5% severe shoulder problems (Pinsolle et al., 1997). All patients could manage their activities of daily living independently.

**Figure 1** Classification of selective neck dissection

<table>
<thead>
<tr>
<th>Classification</th>
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<tbody>
<tr>
<td>Supraomohyoid (levels I, II, III)</td>
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<tr>
<td>Lateral (levels II, III, IV)</td>
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<tr>
<td>Postero-lateral (levels II, III, IV, V)</td>
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<tr>
<td>Anterior (levels VI)</td>
</tr>
</tbody>
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Reprinted from Robbins et al. 1991

In other studies, of supraomohyoid neck dissections, the sample size was small (n = 7 to 36) (Leipzig et al., 1983, Sobol et al., 1985, Cheng et al.,

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2000), the follow-up was short (6 weeks to 6 months) (Leipzig et al., 1983, Sobol et al., 1985, Cheng et al., 2000), or the impact of shoulder morbidity on daily activities was not well described (Leipzig et al., 1983, Sobol et al., 1985, Cheng et al., 2000). Remmler et al., (1986) described 103 patients, of which 76 underwent supraomohyoid neck dissection. In their study the drop out after a year was 73 %, and of the remaining 25 patients it was not reported how many had been subjected to a supraomohyoid neck dissection, and hindrance during daily activities was not described (Remmler et al., 1986).

The purpose of this pilot study was to analyse the prevalence of shoulder pain and disability, following supraomohyoid neck dissection, and to determine which daily activities were disturbed.

Material and methods

Patients in the care of the Department of Oral and Maxillofacial Surgery (University Hospital Groningen) who had undergone supraomohyoid neck dissection, for squamous cell carcinoma of the oral cavity or oropharynx, at least 1 year previously, were asked to participate in this study. Patients who matched our criteria were asked, during a regular follow-up appointment, to participate in the study. A standardized questionnaire was used to assess pain and disability. Patients operated upon bilaterally were asked to refer to the painful shoulder only. The questionnaire was a combination of two valid and reliable questionnaires: the shoulder disability questionnaire (SDQ) (van-der Heijden et al., 2000) and the Groningen activity restriction scale (GARS) (Suurmeijer et al.1994). From these two questionnaires only questions assessing typical shoulder functions were selected. Patients who perceived shoulder pain completed the whole questionnaire while patients without pain filled out if they have perceived temporarily shoulder pain. The frequency of shoulder pain was assessed on a four point Likert scale (shoulder pain was perceived constantly, often, occasionally or never in the last month). Furthermore the questionnaire assessed: waking up because of shoulder pain, pain when lying on the affected shoulder, pain when moving the shoulder, pain when leaning on the arm or elbow, pain when reaching above shoulder level, pain when carrying heavy or light objects, and pain when reaching for the neck. Disability perceived during daily activities was also assessed on a four point Likert scale: patients filled out the level of effort
during daily activities or whether they were dependent on others for their daily activities (fully independently without difficulty, some difficulty, great difficulty, only able to do it with someone’s help). The following daily activities were assessed: dressing, washing, washing hair, light and heavy household activities, facial care and toilet use. In addition information concerning physiotherapy, history of shoulder pain, type of surgery were asked for or collected from the medical records. Data were analysed using SPSS 10.0: chi-square analysis with a continuity correction, and t-test for independent samples.

**Results**
Fifty-six patients were asked to fill in the questionnaire. Of these, 52 returned the questionnaire of which two were excluded from analysis because of missing data. Thus 50 questionnaires (27 females 23 males, mean 63 years, SD: 9) could be analysed. The mean follow-up was 2.3 years (SD: 1.3). Forty patients were operated upon unilaterally, and 10 bilaterally. All operations were between 1995 and 2000. Fourteen patients (28 %, 95% Confidence Interval: 18% - 42%) perceived shoulder pain, of which four experienced this constantly, three often, and seven experienced shoulder pain occasionally. Twenty-seven patients had received radiotherapy of which 10 (37 %) complained of shoulder pain (Table 1).

**Table 1** Shoulder complaints and radiation therapy, gender, follow-up and age

<table>
<thead>
<tr>
<th></th>
<th>Shoulder complaints</th>
<th>No shoulder complaints</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiation Therapy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>19</td>
<td>0.22*</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>18</td>
<td>0.55*</td>
</tr>
<tr>
<td>Follow-up (mean; yrs)</td>
<td>2.2 (SD 2.2)</td>
<td>2.4 (SD 1.2)</td>
<td>0.71**</td>
</tr>
<tr>
<td>Age (mean; yrs)</td>
<td>63 (SD 8.8)</td>
<td>62 (SD 9.0)</td>
<td>0.79**</td>
</tr>
</tbody>
</table>

* Results of Chi-square with continuity correction,
**Results of t-test for independent sample analyses.
SD = standard deviation

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No significant relation was found between shoulder complaints and gender, follow-up interval, or age (Table 1). Of the 14 patients with shoulder complaints 8 had an were operation on their dominant side. One of the patients with shoulder pain reported shoulder pain before surgery.

Activities typically provoking shoulder pain were: moving arm or shoulder, reaching above shoulder level, reaching for the neck, carrying heavy objects, and laying on the shoulder (Figure 2). Due to the shoulder complaints two patients needed help from others during heavy household activities, such as washing windows, or cleaning the floor. Eight patients had difficulties with daily activities but did not require help, and of these eight some perceived difficulties with: washing their hair (five patients), washing and drying themselves (five), light household activities (five), and facial care (four).

**Figure 2** Shoulder pain during daily activities in 14 out of 50 patients following supraomohydoid neck dissection
The correlation between the frequency of shoulder pain and the amount of perceived disability during daily activities was \( r = .89 \) (95 % Confidence Interval: .69 - .96)

Only six out of 14 patients with shoulder complaints had been or were still being treated by a physiotherapist. Of the 36 patients (72%) without shoulder complaints, four patients had experienced temporary shoulder complaints following neck dissection.

**Discussion**

Fourteen of the 50 patients (28%) experienced shoulder problems, despite the preservation of the spinal accessory nerve. As the nerve is partially stripped of its vascular supply during surgery a temporary non-functional nerve or only partially functional nerve may be the result (Soo et al., 1990). Consequently the trapezius muscle may be too weak to stabilize the scapula sufficiently.

Although the group interviewed was only 50 patients, 28% of these perceiving shoulder pain is a significant proportion following this selective type of neck dissection.

The exact source of the post-operative shoulder pain is unknown. Many suggestions of the possible cause have been made: secondary frozen shoulder (Patten and Hillel, 1993), hypertrophic sternoclavicular joint (Cantlon and Gluckman, 1983), and excessive stretching of the rhomboid and levator scapulae muscle (Nori, et al., 1997). Post-operative shoulder pain is not always caused by spinal accessory nerve dysfunction, Saunders et al.(1985) found a weak relationship between trapezius muscle dysfunction and subjective symptoms of shoulder pain (Saunders et al., 1985). Cutting of cutaneous sensory nerves, causing neuropathic pain, or neuromata may also cause shoulder pain (Brown et al., 1988). Most of the authors agree that an important mechanism behind the shoulder pain is the overload of the shoulder girdle as a result of the inability of the trapezius muscle to stabilize the scapula.

Although supraomohyoid neck dissections seem to create less disability when compared with radical- or modified radical neck dissections, the percentage of patients (28%) with shoulder pain after a supraomohyoid neck dissection is relatively high, but considerably lower when compared with radical neck dissections (60%-100%)% (Ewing, 1952, Short et al., 1984,
Brown et al., 1988, Shone and Yardley, 1991) and modified radical neck dissections (36%-77%) (Leipzig et al., 1983, Schuller et al., 1983, Pinsolle et al., 1997). Despite having some difficulties in heavy household activities, most patients could perform their daily activities without the help of others. In this study radiation therapy was not significantly associated with shoulder pain or disability, confirming the statement of Chaplin and Morton (1999) that radiation therapy has no effect on shoulder pain. However others state that radiation therapy may add significantly to permanent post-operative disability (Schuller et al., 1983). These conflicting findings indicate that effects of radiation therapy on shoulder complaints need further investigation.

In this study only six of 14 patients with shoulder complaints were treated with physiotherapy. Physiotherapy is often prescribed to help patients with shoulder complaints following neck dissection the aim being to reduce or prevent shoulder pain by reducing shoulder load, and to increase the strength of other scapula stabilizing muscles to compensate for loss of function of the trapezius muscle. Patients seem to benefit from these physical therapy programmes. (Saunders and Johnson, 1975, Gluckman et al., 1983, Fialka and Vinzenz, 1989, Salerno et al., 2002).

**Conclusion**

Despite the fact that the supraomohyoid neck dissection was developed to reduce shoulder morbidity, 28 % of the patients experienced shoulder pain and disability in daily activities. As this study group was relatively small, the cause and extent of morbidity requires further research.

**Acknowledgement**

The authors thank C. Bron, J.L.M. Franssen and B.G.M. de Valk for their support in developing the questionnaire for this study.

Chapter 2
References

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Summary
Introduction: the purpose of this pilot study was to assess shoulder morbidity; i.e. pain and disability in daily activities, at least one year after unilateral or bilateral supraomohyoid neck dissection.
Patients and methods: 52 patients having been subjected to a supraomohyoid neck dissection filled in a questionnaire assessing pain and daily activities.
Results: 14 (28%) patients complained of ipsilateral shoulder pain following supraomohyoid neck dissection. The disability perceived during daily life, because of shoulder complaints, was minor. The pain and disability experienced during daily activities led to dependency upon other people in two patients. This dependency only existed during heavy household activities.
Conclusion: Despite the fact that this type of neck dissection was developed to reduce shoulder morbidity, 28% of the patients experienced shoulder pain following supraomohyoid neck dissection. The degree of disability due to shoulder complaints, however, was minor.

Introduction
Neck dissection is performed in the treatment of carcinoma of head and neck. In radical neck dissection (Crile, 1906) all lymphnodes at one side of the neck are resected, plus the spinal accessory nerve, the internal jugular vein, and the sternocleidomastoid muscle. Morbidity following radical neck dissection includes, disfigurement, sensory changes, shoulder pain, reduced strength of the trapezius muscle, reduced range of motion of the shoulder, disability in activities of daily life, and even loss of work (Ewing, 1952). Shoulder morbidity is probably the result of sacrificing the spinal accessory nerve, resulting in a paralysis of the trapezius muscle (Remmler et al., 1986). The latter results in a reduction of active abduction, forward flexion of the arm, shoulder pain, and disability in daily activities. The incidence of morbidity after radical neck dissection varies between 60 % and 100 % (Ewing, 1952, Short et al., 1984, Brown et al., 1988, Shone and Yardley, 1991). This is why Bocca et al. (1980) introduced the “functional” or “modified radical” neck dissection in which at least one of the non-lymphatic structures is spared; the spinal accessory nerve, internal jugular vein, or sternocleidomastoid muscle. In most cases the spinal accessory nerve is spared to prevent shoulder morbidity. However the incidence of


